UNITED STATES DISTRICT COURT
DISTRICT OF MINNESOTA

CONDAIR GROUP AG, Plaintiff, v. DRI-STEEM CORPORATION, Defendant.	Case No. 21-CV-0863 (PJS/ECW) ORDER

Paul R. Kitch, Lawrence J. Crain, Allyson M. Martin, Martin F. Trainor, and Paul G. Fina, GREER, BURNS & CRAIN, LTD.; Eric H. Chadwick, DEWITT LLP, for plaintiff.

Kimberly Dodd, Steve Nickels, and Kelsey C. Boehm, FOLEY & LARDNER LLP; Henry M. Helgen, III, and Leland P. Abide, KUTAK ROCK LLP, for defendant.

This is a patent-infringement action brought by plaintiff Condair Group AG ("Condair") against defendant Dri-Steem Corporation ("Dri-Steem"). Condair alleges that humidifiers manufactured by Dri-Steem infringe claim 17 of U.S. Patent No. 10,634,372 (the "'372 patent"), which is owned by Condair. ECF No. 1 ¶¶ 13–14. This matter is before the Court for construction of certain terms of the '372 patent in accordance with *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 390–91 (1996).

I. BACKGROUND

The '372 patent relates to dual-stage vaporizing humidifiers that are connected to HVAC systems and used to humidify entire buildings. ECF No. 1-1 at 12, col. 1,

ll. 22–29.[1] In a typical *single*-stage vaporizing humidifier, fuel is burned near a water tank, the heat from the burning fuel causes the water to boil, the steam generated by the boiling water is vented into the HVAC system for circulation throughout the building, and the hot gases created by the burning of the fuel are separately vented into the atmosphere outside of the building. The aim of a *dual*-stage humidifier is to route the hot gases near the water being piped into the humidifier to refill the water tank, so that the hot gases can be used to warm the water and so that the hot gases can be further cooled before being vented to the outdoors.

Hence, in a dual-stage humidifier, heat is transferred twice: First, heat is transferred in the primary heat exchanger from the burning fuel to the water in the main water tank, and second, heat is transferred in the secondary heat exchanger from the hot gases to the replacement water. This results in energy savings, as the heat in the expelled gases is not wasted but is instead used to heat the replacement water. And because the gases are cooled in the secondary heat exchanger, the gases can be vented to the atmosphere at less cost (as plastic pipes can be used instead of metal pipes) and at less risk (as cooler gases are less likely to cause property damage or personal injury).

[1]When citing documents by ECF number, the Court cites the page numbers generated by the Court's electronic docketing system rather than the document's internal pagination.

Claim 17 of the '372 patent claims the following:

> A *humidifier* comprising:
>
> a burner for burning a fuel within a water tank for generating steam in response to a *demand*;
>
> a primary heat exchanger within the water tank for transferring heat from products of combustion of the fuel to the water within the water tank;
>
> a secondary heat exchanger comprising a combusted gas section coupled to [a] primary heat exchanger for receiving the cooled products of combustion from the primary heat exchanger and a water section for transferring additional heat from the cooled products of combustion to water flowing within the secondary heat exchanger; and
>
> a secondary fill valve connected to the secondary heat exchanger which is *pulsed* to provide cool water for transferring additional heat from the cooled products of combustion to water flowing within the secondary heat exchanger; wherein
>
> the water from a primary fill valve is fed directly into the water tank; and
>
> an outlet of the secondary heat exchanger is fed directly into the water tank.

ECF No. 1-1 at 20, col. 18, ll. 41–62 (emphases added).

The parties dispute the meaning of the three italicized terms—"humidifier," "demand," and "pulsed"—as well as whether the preamble ("A humidifier comprising") is limiting. Generally speaking, Condair advocates for narrow

constructions and Dri-Steem for broad constructions, each seeking to strengthen their positions in advance of an anticipated dispute over whether claim 17 of the '372 patent is valid in light of prior art relating to boilers.

II. ANALYSIS

A. Legal Standard

Courts, not juries, construe patent claims. *Markman*, 517 U.S. at 391. Disputed terms in a claim must be construed in the context of both that individual claim and "the entire patent, including the specification." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). Indeed, the specification, read in light of the prosecution history, is the primary basis for construing patent claims. *Id.* at 1315. Courts may also rely on "extrinsic evidence"—anything other than the patent and its prosecution history—but that evidence is less important than the intrinsic record. *Id.* at 1317.

In general, claim language means whatever it would have meant, ordinarily and customarily, to a person of ordinary skill in the relevant art at the time the patent application was filed. *Id.* at 1312–13. In some cases, the ordinary and customary meaning of claim language to a person of ordinary skill in the art may be identical to the meaning of that language to a lay person who is not skilled in the art. *See id.* at 1314 (acknowledging that claim construction sometimes "involves little more than the application of the widely accepted meaning of commonly understood words").

In their briefs, the parties made no effort to define a person of ordinary skill in the art for purposes of this *Markman* proceeding. The issue was also not addressed at oral argument, except that Condair, in response to a question from the Court, offered that "a person in the art would be a person who's familiar with [the design of] humidifiers." Neither party has argued that anything turns on how the person of ordinary skill in the art is defined. And neither party has argued that someone of ordinary skill in the art would interpret any of the disputed terms differently than would an educated lay person (such as a federal judge).

B. The Preamble

Claim 17's preamble recites simply, "A humidifier comprising[.]" ECF No. 1-1 at 20, col. 18, l. 41. Condair contends that this preamble is limiting, ECF No. 48 at 11, and Dri-Steem contends that it is not, ECF No. 47 at 10. If Condair is correct, then only a humidifier can meet all of the limitations of claim 17; if Dri-Steem is correct, then other devices (such as a boiler) could conceivably meet all of those limitations.

"Whether to treat a preamble as a limitation is a determination 'resolved only on review of the entire[] . . . patent to gain an understanding of what the inventors actually invented and intended to encompass by the claim.'" *Catalina Mktg. Int'l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002) (alterations in original) (quoting *Corning Glass Works v. Sumitomo Elec. U.S.A., Inc.*, 868 F.2d 1251, 1257 (Fed. Cir. 1989));

see also Deere & Co. v. Bush Hog, LLC, 703 F.3d 1349, 1357 (Fed. Cir. 2012) (this determination is made "on the facts of each case in light of the overall form of the claim, and the invention as described in the specification and illuminated in the prosecution history" (quoting *Applied Materials, Inc. v. Advanced Semiconductor Materials Am., Inc.*, 98 F.3d 1563, 1572–73 (Fed. Cir. 1996))). Although there is "[n]o litmus test defin[ing] when a preamble limits claim scope," the Federal Circuit has given courts "[s]ome guideposts" to help with that determination. *Catalina Mktg.*, 289 F.3d at 808. One of those guideposts is that, "[i]n general, a preamble limits the invention if it recites essential structure or steps, or if it is 'necessary to give life, meaning, and vitality' to the claim." *Id.* (quoting *Pitney Bowes, Inc. v. Hewlett–Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999)); *see also Deere & Co.*, 703 F.3d at 1357 (same).

The "life, meaning, and vitality" guidepost is not terribly helpful; it has a bit of a know-it-when-I-see-it feel to it. *Cf. Jacobellis v. Ohio*, 378 U.S. 184, 197 (1964) (Stewart, J., concurring). But a few Federal Circuit cases provide some insight into how that phrase should be applied.

For example, *Corning Glass Works* addressed a dispute over whether a preamble reciting "[a]n optical waveguide" was limiting. 868 F.2d at 1256. Noting that "[t]he effect preamble language should be given can be resolved only on review of the entirety of the patent to gain an understanding of what the inventors actually invented and

intended to encompass by the claim," the Federal Circuit held that the preamble was indeed limiting. *Id.* at 1257 ("Here, the [later patent's] specification makes clear that the inventors were working on the particular problem of an effective optical communication system not on general improvements in conventional optical fibers."). The patent's specification had defined an optical waveguide to be a "unique type of optical fiber" and taught that, "if an optical fiber is to function as an optical waveguide," that fiber must have "carefully coordinated" "physical characteristics and parameters" not inherent to optical fibers in general. *Id.* at 1256 (quoting U.S. Patent No. 3,659,915, col. 1, ll. 49–51, 65–70). Thus, the court held, "[t]o read the claim in light of the specification indiscriminately to cover all types of optical fibers would be divorced from reality." *Id.* at 1257. In that sense, the preamble "g[a]ve 'life and meaning' and provide[d] further positive limitations to the invention claimed." *Id.*

Other cases that invoke a similar understanding of "life, meaning, and vitality" include *Kropa v. Robie*, 187 F.2d 150, 152 (C.C.P.A. 1951) (observing that, usually, in cases in which the preamble was considered limiting, "there inhered in the article specified in the preamble a problem which transcended that before prior artisans and the solution of which was not conceived by or known to them"); *Hall v. Shimadzu*, 59 F.2d 225, 227 (C.C.P.A. 1932) (holding preamble reciting a "process of manufacturing a fine powder of lead suboxide" was limiting because "the production of suboxide of lead is the whole

purpose of appellee's process"); and *Braren v. Horner*, 47 F.2d 358, 364 (C.C.P.A. 1931) (observing that, in cases where "introductory words" were "considered as limitations," the words considered in that fashion "were an essential element in the novelty of the device and of the invention in issue there").

In this case, the patented invention aims to solve a key problem that inheres in commercial vaporizing humidifiers. Vaporizing humidifiers, which "dominate[] the industry for most commercial humidification systems," ECF No. 1-1 at 12, col. 1, ll. 44–47, work "by heating or boiling water, releasing steam and thereby moisture into the air," *id.* at 12, col. 1, ll. 47–48. The heat for warming the water to produce steam comes from the combustion of fuel such as natural gas or oil. *See id.* at 12, col. 1, ll. 65. The problem is that combustion creates very hot gases that must be vented into the environment through an exhaust outlet. *See id.* at 12, col. 2, ll. 6–10. Venting very hot gases into the atmosphere is wasteful, costly, and dangerous.

The innovation reflected in the '372 patent is to put the hot gases to use heating replacement water (thereby reducing waste) and, in doing so, to cool those gases further (thereby reducing cost and danger). *Id.* at 12, col. 1, l. 65–col. 2, l. 2. But because a vaporizing humidifier works precisely because it boils water, the water already present in the water tank cannot absorb much additional latent heat from the exhaust gases; in other words, the fuel combustion that produces the exhaust gases also heats the water

to boiling, rendering the water incapable of absorbing much heat from the exhaust gases. *See id.* at 12, col. 2, ll. 3–7. Moreover, that water, once vaporized into steam, is "releas[ed] . . . into the air" in order to increase the ambient humidity of a room or building, *id.* at 12, col. 1, ll. 47–48, 22–23; obviously, that released water can no longer be used to capture heat from the hot gases created by fuel combustion. (Also, because the water is released into the air, the water needs to be replaced.)

The invention solves this problem by introducing a "dual-stage" heat-exchange mechanism. When new (cold) water enters the humidifier to replace the water lost through steam, the water passes through piping that is surrounded by other piping through which the hot exhaust gases are passing on their way to being vented into the atmosphere. *Id.* at 16, col. 10, ll. 4–20. As the cold water runs alongside the hot gases, heat moves by conduction from the gases to the water. *Id.* (Exactly where this occurs depends on the particular embodiment of the invention.) The replacement water is heated before it enters the main tank (so it will take less energy to boil that water), and the exhaust gases are further cooled on their way to the atmosphere (making it cheaper and safer to vent them to the outdoors). *Id.*

The ′372 patent's specification "makes clear that the inventors were working on the particular problem of" eliminating the inefficiencies of existing vaporizing humidifiers, not on "general improvements" to heat-exchange systems. *Corning Glass*

Works, 868 F.2d at 1257. Moreover, a person of ordinary skill in the relevant art who picks up the '372 patent and reads it from first word to last would have no inkling that it is claiming anything but humidifiers. The patent is titled "Dual-Stage *Humidifier* Methods and Systems." ECF No. 1-1 at 2, l. 54 (emphasis added). The patent describes every one of its figures as a "humidifier." *Id.* at 13, col. 4, ll. 10–32. The patent includes the term "humidifier" in every one of its claims. *Id.* at 19–20. And, by the Court's count, the patent uses the word "humidifier" or "humidifiers" 109 times. *See Deere & Co.*, 703 F.3d at 1358 (holding that a preamble reciting "rotary cutter deck" was limiting because, among other things, "[t]he title of the patent, the summary of the invention, and every drawing describe the invention as a deck for a rotary cutter"). If the drafter of the '372 patent did not intend to limit it to humidifiers, then he was an inept drafter.

Turning to claim 17 specifically: If the invention recited in claim 17 were *not* a vaporizing humidifier—if instead claim 17 simply described a heat-exchanger system that could be used in boilers and other steam-generating devices—then the invention would solve problems that would not necessarily be present in the prior art. For example, if the water in the main tank were not heated to a boil, then it would be able to absorb more latent heat from exhaust gases in the first heat exchange. Or if the water were not released into the atmosphere as steam, it would be able to absorb latent heat from later instances of combustion, and it would not need to be replaced by cold water

that needs to be heated before entering the water tank. It was these physical constraints on the design of *humidifiers* that prompted the need for the patented invention. *See id.* (holding that a preamble reciting "rotary cutter deck" was limiting because, among other things, "[t]he specification explains that the invention addresses a concern specific to rotary cutters").

For these reasons, the Court finds that the preamble to claim 17 gives that claim "life, meaning, and vitality" and therefore is limiting. Thus, only a humidifier—and not something that is not a humidifier—can meet all of the limitations of claim 17.

C. "Humidifier"

The parties say that they dispute the meaning of "humidifier," but at the hearing, the parties more or less agreed that the term should be defined as it is in the specification. A patentee may act as her "own lexicographer" by "clearly set[ting] forth a definition of the disputed claim term." *Thorner v. Sony Computer Ent. Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (quoting *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002)). Here, Condair has done so. Condair has expressly defined a "humidifier" to be "a device that increases humidity (moisture) in a single room or an entire building." ECF No. 1-1 at 12, col. 1, ll. 22–23. The Court adopts that definition.

D. "Demand"

One of the elements of claim 17 is "a burner for burning a fuel within a water tank for generating steam in response to a demand." *Id*. at 20, col. 18, ll. 42–43. Condair contends that "demand" should be construed as a "demand for *humidification*," which Condair then defines as "steam at atmospheric pressure for use to increase the water content of the air in a room or space such as via a HVAC system." ECF No. 41 at 19 (emphasis added). Dri-Steem contends that the Court should give "demand" its plain and ordinary meaning. ECF No. 47 at 16.

The parties essentially agree that "demand" refers to a demand for steam.[2] *See* ECF No. 41 at 19; ECF No. 47 at 19. The dispute centers on whether the demanded steam's *function* (humidification vs. heat vs. something else) should limit the scope of the claim. Condair seeks a construction that would limit the function of the demanded steam to humidification, as Condair wants to distance claim 17 from prior art describing boilers (which use steam to heat, not to humidify). ECF No. 41 at 12, 19. But, besides smuggling in concepts that are not inherent in the word "demand," Condair's definition would result in multiple redundancies in the patent. For example, in the specification,

[2]The specification *could* be read to contemplate a demand for something *other* than steam. ECF No. 1-1 at 16, col. 10, ll. 25–27 ("[T]he Pulsed Water Inlet . . . is employed during 'fine' water actions of the humidifier when a demand is present, e.g. a demand for steam." (emphasis added)). But there is no plausible candidate for what that something else might be. It is more likely that the drafter erroneously used "e.g." (in English, "for example") instead of "i.e." (in English, "that is").

"the humidity demand may range from nothing to all the desired level," ECF No. 1-1 at 12, col. 1, ll. 62–63, would become "the humidity demand for humidification may range from nothing to all the desired level." And in claim 6, "the demand for steam from the humidifier," *id.* at 20, col. 17, l. 9, would become "the demand for humidification for steam from the humidifier."

As explained above, the term "humidifier" in the preamble already limits the scope of the claim to "a device that increases humidity (moisture) in a single room or an entire building." ECF No. 1-1 at 12, col. 1, ll. 22–23. In other words, the fact that claim 17 is limited to a *humidifier* that "generat[es] steam in response to a demand" means that the steam will *necessarily* be used for humidification. Thus, restricting the purpose of the demanded steam to humidification would not have any practical impact on the scope of the claim, but it would distort the meaning of the common word "demand" and create the redundancies noted above. The Court will therefore construe "demand" to mean simply "requirement"—which the Court deems to be the plain and ordinary meaning of the term.[3]

---

[3] *See, e.g.*, *Demand*, Webster's Third New International Dictionary of the English Language Unabridged (1993) ("6 : the requirement of work or of the expenditure of some resource"); *Demand*, The Random House Dictionary of the English Language Unabridged (2d ed. 1987) ("8. an urgent or pressing requirement"); *Demand*, The American Heritage Dictionary of the English Language (4th ed. 2000) ("4. To require as useful, just, proper, or necessary; call for . . . . 3. An urgent requirement or need . . . .").

E. "Pulsed"

The last term in dispute is "pulsed" as used in the following element of claim 17: "a secondary fill valve connected to the secondary heat exchanger which is *pulsed* to provide cool water for transferring additional heat from the cooled products of combustion to water flowing within the secondary heat exchanger." *Id.* at 20, col. 18, ll. 54–58 (emphasis added). Condair proposes the construction "repeatedly opened and closed at a rate to control the rate at which water is supplied to the secondary heat exchanger." ECF No. 41 at 23. Dri-Steem again urges the Court to apply the plain and ordinary meaning of the term, ECF No. 47 at 21, but at oral argument, Dri-Steem struggled to identify that plain and ordinary meaning. That is unsurprising, as "pulsed" does not really have a plain and ordinary meaning. A layperson is unlikely to have much experience with the term "pulsed." (A layperson would have experience with the term "pulse," but only in the context of taking one's pulse to measure a heartbeat.)

In the humidifier disclosed in claim 17,[4] the function of the secondary fill valve is to fine-tune the amount of replacement water that passes through the secondary heat exchanger and enters the main tank. ECF No. 1-1 at 16, col. 10, ll. 25–27. In general, the higher the demand for steam, the more water is lost from the main tank and the greater

[4]One unfortunate feature of this case is that none of the patent's figures appears to depict the embodiment disclosed in claim 17.

the need for replacement water. *See id.* at 17, col. 10, ll. 64–66. But fine-tuning is necessary to ensure that replacement water does not enter the main tank so quickly as to overly cool the water remaining in the main tank. *See id.* at 17, col. 11, l. 64–col. 12, l. 3. (Even though the replacement water becomes warmer as it passes through the secondary heat exchanger, the replacement water does not become as hot as the water in the main tank. *See id.*) That is because it would require significantly more energy—and thus more fuel—to boil water that has been cooled, squandering the efficiency gains from using the secondary heat exchanger. *Id.*

To obtain that fine-tuning, the humidifier "pulses" the secondary valve by opening or closing the valve to start or stop the flow of replacement water into the secondary heat exchanger. But, unlike the pulse of a heartbeat, that opening and closing is not necessarily a rhythmic repetition of a single, quick pump of water. Rather, a single "pulse" is a time interval during which the valve is closed combined with another time interval during which the valve is open (which may be shorter or longer than the time the valve is closed). *See id.* at 17, col. 12, ll. 39–44. The humidifier calculates the length of the "open" time interval according to several variables, including "demand, blowdown, burner capacity, number of active burners and fill correction values." *Id.* at 17, col. 12, ll. 42–55. Depending on the relative lengths of the times during which the valve is open or closed, the water enters the secondary tank at

an average rate that is somewhere between "none" and the rate at which water would flow if the valve were always open. *See id.*[5]

Note that the length of the "open" time interval could also be zero, meaning that the valve is not opened at all during a given "pulse." *See id.* (setting the "open" time to zero if there is no demand). Thus, Condair's proposed modifier "repeatedly" to the verbs "opened" and "closed" is problematic; the valve may remain completely closed for many pulses in a row. For that same reason, the conjunction "or" between those two verbs is more accurate than "and"; a single pulse may not involve opening the valve.

Putting all this together, a person of ordinary skill in the art would understand "pulsed," as used in claim 17, to mean "opened or closed for time intervals to control the average rate at which water flows." The Court will therefore construe the term "pulsed" in this fashion.

---

[5]The pulsed valves relevant to claim 17 cannot be partially opened; they are either entirely open or entirely closed. The patent uses the term "modulating valve" for a valve that *can* be partially opened. *See* ECF No. 1-1 at 19, col. 16, ll. 45–50; *id.* at 20, col. 18, ll. 31–36 (contrasting a "modulating valve" and a "pulsed valve"). That term does not appear in claim 17.

ORDER

Based on the foregoing, and on all of the files, records, and proceedings herein, the Court construes the disputed claim language as stated above.

Dated: August 22, 2022

s/Patrick J. Schiltz
Patrick J. Schiltz, Chief Judge
United States District Court